

13 ALCOHOLIC BEVERAGE ANALYSIS	Page 1 of 3
Division of Forensic Science TOXICOLOGY TRAINING MANUAL	Amendment No.:
	Effective Date: 26-March-2004
<p style="text-align: center;">13 ALCOHOLIC BEVERAGE ANALYSIS</p> <p>13.1 Objectives</p> <p>13.1.1 Display a working knowledge of alcoholic beverages (history, terminology, manufacturing processes, chemical formulations and compositions of various beverages).</p> <p>13.1.2 Demonstrate proficiency in organoleptic evaluations of beverages (clarity, color, bouquet and flavor).</p> <p>13.1.3 Demonstrate proficiency in the analysis of beverages for alcohol content and trace congeners.</p> <p>13.1.4 Demonstrate proficiency in the analysis of lead content using flame atomic absorption spectroscopy.</p> <p>13.1.5 Demonstrate proficiency in wet chemical techniques applied to the analysis of alcoholic beverages (evaporated solids, total acids, specific gravity and volumetric distillations).</p> <p>13.1.6 Interpret findings in order to identify types and classes of alcoholic beverages.</p> <p>13.2 Estimated Time: Four Months</p> <p>13.3 Methods of Instructions</p> <p>13.3.1 Lectures</p> <p style="padding-left: 40px;">13.3.1.1 Manufacturing of alcoholic beverages</p> <p style="padding-left: 40px;">13.3.1.2 Physical make up of alcoholic beverages</p> <p style="padding-left: 40px;">13.3.1.3 Chemical formulations and compositions of alcoholic beverages</p> <p style="padding-left: 40px;">13.3.1.4 Principles of direct injection GC</p> <p style="padding-left: 40px;">13.3.1.5 Principles of wet chemical techniques</p> <p style="padding-left: 40px;">13.3.1.6 Principles of atomic absorption spectroscopy</p> <p>13.3.2 Literature Review</p> <p style="padding-left: 40px;">13.3.2.1 Amerine, M. <i>Laboratory Procedures for Enologists</i>. UC Davis, 1967.</p> <p style="padding-left: 40px;">13.3.2.2 Barnett, J.H. and J.R. Einsman. <i>Occurrence and Distribution of Congeners in Distilled Alcohol Spirits</i>. J Assoc of Official Analytical Chemists Vol 60, 1977.</p> <p style="padding-left: 40px;">13.3.2.3 Lange, N.A. <i>Lange's Handbook of Chemistry</i>. New York: McGraw-Hill, 1967.</p> <p style="padding-left: 40px;">13.3.2.4 Lembeck, H. <i>Grossman's Guide to Wine, Beers and Spirits</i>. New York: Charles Scribner's Sons, 1983.</p> <p style="padding-left: 40px;">13.3.2.5 Lichine, A. <i>Alexis Lichine's Encyclopedia of Wines and Spirits</i>. New York: Alfred Knopf, Inc., 1983.</p> <p style="padding-left: 40px;">13.3.2.6 <i>Official Methods of Analysis of the Association of Official Analytical Chemists</i>. 15th Ed., 1990.</p> <p style="padding-left: 40px;">13.3.2.7 Slavin, M. <i>Atomic Absorption Spectroscopy</i>. New York: John Wiley and Sons, Inc., 1978.</p> <p>13.3.3 Demonstration</p>	

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<div> <p>13.3.3.1 Alcoholic beverage analyses will be observed from beginning to end and notes will be taken by the Trainee.</p> <p>13.3.4 Laboratory Exercises</p> <p>13.3.4.1 Perform all of the following analyses on 20 different alcoholic beverages</p> <p>13.1.1.1.1 Organoleptic evaluation: clarity, color, bouquet and flavor</p> <p>13.1.1.1.1 Ethanol content by headspace GC</p> <p>13.1.1.1.1 Congener distribution by direct injection GC</p> <p>13.1.1.1.1 Lead content by atomic absorption spectroscopy</p> <p>13.1.1.1.1 Evaporated solids</p> <p>13.1.1.1.1 Total acids</p> <p>13.1.1.1.1 Specific gravity</p> <p>13.4 Evaluation:</p> <p>13.4.1 Written Examination</p> <p>13.4.1.1 This will be administered as a “take home” exam.</p> <p>13.4.2 Laboratory Competency Testing</p> <p>13.4.2.1 A series of at least 20 different alcoholic beverages will be presented to the Trainee for a routine alcoholic beverage determination. Trainee must assess what tests to perform based on organoleptic evaluation, and then must perform various analyses. Quantitative results must agree within 5% of the previously determined result and qualitative results must agree descriptively (e.g. bouquet, unaged, illegally distilled).</p> <p>13.5 Examination Questions</p> <p>13.5.1 Explain when calibration or recalibration of the headspace GC is necessary. How is recalibration accomplished?</p> <p>13.5.2 What is NIST? Why is it important?</p> <p>13.5.3 Describe the ranges of alcohol content for the following alcoholic beverages: table wines, fortified wines, light beer, premium beer, malt liquors, special stouts, and distilled spirits.</p> <p>13.5.4 What are ethanolic congeners?</p> <p>13.5.5 What are the congeners known as fusel oils?</p> <p>13.5.6 What does the ratio of fusel oils indicate in distilled spirits?</p> <p>13.5.7 What are the key characteristics that distinguish legally distilled vs illegally distilled spirits?</p> </div>	

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<p>13.5.8 What acids are found in alcoholic beverages and what are the predominant acids in distilled spirits and table wines?</p> <p>13.5.9 What is proof?</p> <p>13.5.10 How does straight bourbon whiskey obtain its amber color?</p> <p>13.5.11 How does blended whiskey obtain its amber color?</p> <p>13.5.12 What is fermentation?</p> <p>13.5.13 What is mash?</p> <p>13.5.14 What is distillation?</p> <p>13.5.15 What are distilled spirits?</p> <p>13.5.16 Define new and raw.</p> <p>13.5.17 What is the legal limit for lead in distilled alcoholic spirits? What lead level would be considered hazardous?</p> <p align="right">♦ End</p>	